commonality is used as a basis of developing an integrated framework that allows a user to access all relevant information on a single platform independent of the data family.

Based on object-oriented technology, the implementation of the multi-data framework of the present invention can be realized by using object pointers to create composite geographic objects with encapsulated data regarding each object type. Topology is required and is specified only for the vector data. However, for a object-oriented framework integrated across data formats, it is necessary to know topological relationships among objects of different data types and coverages to create integrated, composite geographic objects.

The spatial indexing scheme of quad tree indexing and the non-spatial attribute indexing scheme both are used by the present invention. The quad tree indexing scheme is used to find the vicinity of the sought criteria. Then, the other object-oriented indexing schemes based on attribute (nested index, path index, and multi-index) may be used within the selected vicinity of the searching criteria.

Although preferred embodiments of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principle and spirit of the invention, the scope of which is defined in the appended claims and their equivalents.

What is claimed is:

1. A method of building and maintaining an object-oriented database from a vector product format (VPF) database, comprising:

instantiating objects of the object-oriented database, using the VPF database;

initializing spatial and non-spatial feature data of the object-oriented database, thereby creating a feature level having,

non-spatial data which provides characteristic properties of each feature;

spatial data, including primitive data and topological information, which

provides spatial relationships between a feature object and other feature objects within a specified coverage; and

wherein related non-spatial and spatial data are directly accessible from the feature object;

spatially indexing data among objects across hierarchical levels of the object-oriented database; and

updating spatial and non-spatial data.

2. The method according to claim **1**, wherein the step of updating spatial and non-spatial data includes adding, changing, and deleting feature, primitive, and topological data within the database and further includes updating all object links referencing the feature, primitive, and topological data.

3. The method according to claim **1**, wherein the step of spatially indexing data is applied to one or more databases whose format comprises:

a flat file;

a raster product format;

a vector product format; and

a text format.

4. The method according to claim **3**, further comprising a step of retrieving data objects matching a user-specified query based on at least one of the following data characteristics:

feature attributes;

geometrical constraints;

topological constraints; and

geographical constraints.

5. The method according to claim **4**, wherein the step of retrieving data objects includes:

a flat file;

a raster image;

a VPF feature; and

text data.

6. A method of building and maintaining an object-oriented spatial database from at least two of a vector product format (VPF) database, a raster product format (RPF) databases

and a text product standard (TPS) database, comprising:

instantiating objects of the object-oriented database, using at least two of the VPF, RPF, and TPS databases;

initializing spatial and non-spatial feature data of the object-oriented database;and

spatially indexing data among objects from the at least two VPF, RPF, and TPS databases into the single, object-oriented spatial database.

7. A method of building and maintaining a database, comprising:

creating an object-oriented database from a relational geospatial database with feature objects having non-spatial data, which provides characteristic properties of each feature, and spatial data, including primitive data and topological information, which provide spatial relationships between a feature object and other feature objects within a specified coverage, wherein related non-spatial and spatial data are directly accessible from the feature object.

8. A method of searching an object-oriented hierarchical database of spatial data, comprising:

listing all databases containing feature data of a user-selected spatial point of interest;

listing all libraries, within a user-selected database from the list of databases, containing data intersecting the user-selected spatial point of interest;

listing coverages and features, within a user-specified library from the list of libraries; and

listing objects from the user-selected database that satisfy a user-selected point of interest and user-selected coverages and/or features, wherein the listed objects include:

a flat file;

a raster image;

a VPF feature; and

text data.

9. The method according to claim **1**, wherein the step of listing objects further includes the step of searching the object-oriented hierarchical database by one or more of the following data characteristics:

feature attributes;

geometrical constraints;

topological constraints; and

geographical constraints.

10. A computer system comprising:

a storage medium storing an object-oriented hierarchical database based on a VPF database;

a processor spatially indexing data among objects across hierarchical levels of the object-oriented hierarchical database;